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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/821,957	04/12/2004	Takayuki Suzuki	Q80989	2365

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EXAMINER	
LANGMAN, JONATHAN C	

ART UNIT	PAPER NUMBER
1794	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/821,957	SUZUKI, TAKAYUKI	
	Examiner	Art Unit	
	JONATHAN C. LANGMAN	1794	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 November 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-8* is/are pending in the application.

4a) Of the above claim(s) *3-7* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,2 and 8* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on November 17, 2008 has been entered.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 2, and 8 are rejected under 35 U.S.C. 102(a) and 102 (e) as being anticipated by Melnik et al., (US 6,936,357).

Regarding claim 1, Melnik et al. teach a self supported nitride semiconductor with a diameter of 10mm or more and thickness greater than 200 microns (col. 3, lines 15-

18). Melnik go on to teach that the bulk nitride semiconductor preferably has a FWHM (full width half maximum) of the x-ray rocking curve ranging from 60-360 arc seconds for the (0002) diffraction plane.

Since Melnik teaches that the FWHM in the (0002) of the semiconductor layer is 60, it can be assumed, expected and inherent that the plane of {20-24} within Melnik's semiconductor is less than 360 arc seconds. **The burden is upon the applicant t**o show that the instantly claimed FWHM for the instantly claimed diffraction plane is not present within the structure of Melnik, and **the applicant is invited to show evidentiary support showing otherwise**. The material and process of making the material of Melnik is substantially the same to the applicants claimed material and processes. Therefore, it is inherent, although Melnik is silent to, that the FWHM of 278 arc sec or less for {20-24} is present.

It has been held that where the claimed and prior art products are identical or substantially identical in structure or are produced by identical or a substantially identical processes, a prima facie case of either anticipation or obviousness will be considered to have been established over functional limitations that stem from the claimed structure. *In re Best*, 195 USPQ 430, 433 (CCPA 1977), *In re Spada,* 15 USPQ2d 1655, 1658 (Fed. Cir. 1990). The ***prima facie*** case can be rebutted by evidence showing that the prior art products do not necessarily posses the characteristics of the claimed products. *In re Best*, 195 USPQ 430, 433 (CCPA 1977).

The applicant's amendment to the claims of using a base seed substrate to grow the self supported nitride semiconductor, wherein the base seed substrate is of a

different material is a product by process limitation. The end result of the instant claims is still a self supported nitride substrate as taught by Melnik and Albrecht. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.", (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

Regarding claim 2, Melnik teaches that the semiconductor may be doped during growth to achieve n or p-type conductivity the carrier concentration is less than 10^{20} atoms/cm^3 (col. 10, lines 1-10).

Regarding claim 8, Melnik et al. teach growing a diode structure upon the substrates with epitaxial deposition of a nitride layer thereon (see at least col. 12, lines 63-67).

Claims 1, 2, and 8 are rejected under 35 U.S.C. 102(a) and 102 (e) as being anticipated by Melnik et al. (US 6,936,357) as evidenced by Albrecht et al, "Dislocation reduction in AlN and GaN Bulk Crystals Grown by HVPE".

Regarding claim 1, Melnik, as discussed above, teaches a bulk nitride semiconductor grown by HVPE with large dimensions that has a FWHM of 60-360 for a (0002) diffraction plane. Previous work of Melnik et al. (Albrecht et al.), characterized a HVPE grown nitride semiconductor. Albrecht characterized the semiconductor for its FWHM at {11-24} and found it to be around 110 seconds (table 1). The (0002) plane of Albrecht falls within the range taught by Melnik.

Albrecht is silent to the FWHM of the {20-24} plane. Within the instant specification the applicant's teach a low FWHM of {11-24}, and {20-24} for a nitride semiconductor grown by HVPE. When reviewing the examples provided by the applicant within the specification, the Examiner sees a strong correlation between Nitride semiconductors when evaluated in the two planes of {11-24} and {20-24} in values for FWHM for HVPE grown nitride semiconductors. Values for the {20-24} and {11-24} planes are shown by the applicants to be 278 and 286, respectively, on page 12; 550 and 568 respectively in comparative example 1; 820 and 845 for comparative example 2; and 322 and 336 respectively in Example 2. Further support for the Examiners position of the direct correlation of FWHM's of the {11-24} and {20-24} planes as is evidenced by Table 2 of page 18 of the instant specification. For all examples shown, the FWHM's as measured for grown nitride films in the {20-24} and

{11-24} planes share a close relationship. The Examiner is not arguing that the values are the same, merely that there is a close correlation between the two planes.

It is the Examiners position that since Melnik teaches a FWHM of 60 arc seconds for a (0002) plane, that Melnik necessarily has, in light of Albrecht, a FWHM in the {11-24} plane of a low value. Furthermore in light of the applicants teaching of the correlation between the (1124) and the (2024) planes that Melnik will then necessarily and inherently possess a FWHM in the (20-24) plane of less than 278 seconds.

The burden is upon the applicant to show evidentiary support that Melnik possesses a FWHM in the (20-24) plane of less than 278 seconds).

Regarding claim 2, Melnik teaches that the semiconductor may be doped during growth to achieve n or p-type conductivity the carrier concentration is less than 10^{20} atoms/cm^3 (col. 10, lines 1-10).

Regarding claim 8, Melnik et al. teach growing a diode structure upon the substrates with epitaxial deposition of a nitride layer thereon (see at least col. 12, lines 63-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1, 2, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Dislocation reduction in AlN and GaN Bulk Crystals Grown by HVPE" to Albrecht et al. in view of Melnik et al. (US 6,936,357).

Regarding claim 1, Albrecht et al. teach GaN and AlN crystals grown by hybrid vapor phase epitaxy (HVPE). The GaN crystals have a FWHM, (full width at half maximum) of rocking curves from a GaN bulk crystal at a diffraction plane of {11-24} plane of 110-180 arc seconds (Albrecht et al., Table 1). Albrecht is silent to the FWHM of the {20-24} plane. Albrecht teaches a low FWHM for the {11-24} plane of a nitride semiconductor grown by HVPE, and within the instant specification the applicant's teach a low FWHM of {11-24}, and {20-24} for a nitride semiconductor grown by HVPE. When reviewing the examples provided by the applicant within the specification, the Examiner correlates that the two planes of {11-24} and {20-24} are very similar in values for FWHM for HVPE grown nitride semiconductors. Values for the {20-24} and {11-24} planes are shown by the applicants to be 278 and 286, respectively, on page 12; 550 and 568 respectively in comparative example 1; 820 and 845 for comparative example 2; and 322 and 336 respectively in Example 2. Due to the applicants specification teaching the close correlation of FWHM's between the two diffraction planes, and that the prior art and the instant specification teach similar materials and similar processes for achieving them, it is assumed, expected and intrinsic that the FWHM of {11-24} plane of Albrecht will also correlate to the FWHM of {20-24} plane, and thereby would inherently fall within the applicants' instantly claimed range of less than 278 arc seconds. The applicant is directed to the case law In re Best presented above.

Albrecht teach in section 2.1 that GaN crystals are grown to a maximum size of about 7 mms diameter and 100 microns thickness. Albrecht thus fails to teach the specified dimensions of the instant claim. However, Melnik et al. who share common inventors with Albrecht et al., have shown the production of large scale nitride semiconductors overlapping the instantly claimed dimensions. It is a natural progression in the technology of semiconductor based electronics to make the substrates as large as possible in order to improve production and costs, by providing larger substrates to build devices upon. It is well known in the art and also taught by Melnik et al. that nitride semiconductor substrates can be grown by HVPE with large diameter dimensions. Melnik et al. teach that the nitride substrate crystals will have a minimum dimension of 1 cm in the x, y, and z directions. Thus showing a crystal with a diameter of 10 mm (1 cm) or more (Melnik et al. col. 3, lines 10-17). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to grow the nitride semiconductor as taught by Albrecht et al. comprising a FWHM of less than 500 microns at {11-24} and inherently {20-24}, to a diameter of 10 mm or more, because Melnik et al. have shown that nitride semiconductor crystals of these diameters are grown in the art with HVPE, (the same method of Albrecht et al..), and it has been shown that a desire to grow larger crystals is present.

Furthermore, it would have been obvious to a person having ordinary skill in the art at the time of the invention to adjust the diameter for the intended application because, where the only difference between the prior art and the claims is a recitation of relative dimensions of the claimed device and a device having the claimed relative

dimensions would not perform differently than the prior art device, the claimed device is not patentably distinct from the prior art device. *In Re Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984) cert. denied, 469 U.S. 830, 225 USPQ 232 (1984)* .

Regarding claim 2, the crystal as taught by Albrecht et al. is never mentioned to be doped therefore it is assumed that it is undoped. Albrecht et al. teach that the dislocation (carrier) density is said to be as low as 3×10^6 cm^{-2} (Albrecht et al. pg 455). And in another example teach that the dislocation density ranges from 10^9 to 10^5 cm^{-2} (Albrecht et al., pg. 456), which falls within the instantly claimed ranges. Also Melnik et al. teach that the dislocation density is preferably less than 10^4 cm^{-2} (Melnik et al., col. 5, lines 5-10).

Furthermore, Melnik et al. teach that the bulk nitride semiconductor material may be doped during growth to achieve n-, I-, or p- type conductivity as desired (Melnik et al., abstract). It would have been obvious to a person having ordinary skill in the art at the time the present invention was made to dope the structure of Albrecht et al. to any desirable conductivity. Dependent upon the specific application any dopant amount may be used to achieve desired conductivities. It would have been obvious to one having ordinary skill in the art at the time of the invention to adjust the dopant levels, including that presently claimed, for the intended application to achieve desired conductivities, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 8, Albrecht et al. teach a freestanding nitride semiconductor wafer as described above, however, they are silent to the formation of a light-emitting device on the substrate. The substrate as taught by Albrecht et al. is more than capable of being used as a substrate for the formation of an LED. Furthermore, Melnik et al. teach that the GaN substrates are used in the applications of light emitting diodes where devices are formed on the GaN substrates of the invention (Melnik et al, col. 1, lines 15-40). It would have been obvious to use the substrate of Albrecht et al. to build an LED device on top, as Melnik has shown the two nitride semiconductor substrates to be functional equivalents.

Response to Arguments

Arguments in Regards to the anticipation rejection over Melnik.

The applicant's amendment to the claims of using a base seed substrate to grow the self supported nitride semiconductor, wherein the base seed substrate is of a different material is a product by process limitation. The end result of the instant claims is still a self supported nitride substrate as taught by Melnik and Albrecht. Even though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.", (In re Thorpe, 227 USPQ 964,966). Once the Examiner provides a rationale tending to show that the claimed product appears to be the same or similar to that of the prior art, although produced by

a different process, the burden shifts to applicant to come forward with evidence establishing an unobvious difference between the claimed product and the prior art product (In re Marosi, 710 F.2d 798, 802, 218 USPQ 289, 292 (Fed. Cir. 1983), MPEP 2113).

While applicants' state that a self-supported nitride semiconductor substrate grown on a base substrate made of a different material from that of the self-supported substrate would have different features (specifically FWHM's in the (20-24) plane) than, for instance, the GaN substrate of Melnik grown on a base substrate made of the same material from that of the self-supported substrate, applicant provides no evidence to support this position. These arguments are merely conclusory statements made by the attorney and not supported by evidence.

The applicant's arguments to Melnik, where Melnik teaches 300 arc seconds for the [0002] plane (col. 11 lines 30-35) is considered however it is the examiners position that Melnik teaches a wide range of between 60 and 360 seconds (col. 8, lines 10-16). The "applicant must look to the whole reference for what it teaches. Applicant cannot merely rely on the examples and argue that the reference did not teach others." In re Courtright, 377 F.2d 647, 153 USPQ 735,739 (CCPA 1967).

The applicants then argue that there is a tendency to have a corresponding larger value of FWHM in a (20-24) plane that that in a (0002) plane. In light of the applicants' Declaration dated September 20, 2006, the Examiner agrees that this statement may be true. However it is not commensurate with the scope of Melnik. Melnik teaches a wide range of achieved FWHM's and the applicant has not

persuasively argued the instance where Melnik teaches that the FWHM of the (0002) plane is 90 or 60 arc seconds.

The applicant acknowledges that Melnik teaches a FWHM of 60-360 arc seconds, on page 9 second paragraph. However the applicant then argues product by process limitations, which for reasons set forth above are not persuasive arguments.

Melnik as evidenced by Albrecht

In reviewing the prior art of record against the newly amended claims the Examiner Notes:

- None of the prior art of record specifically teaches the FWHM of the [20-24] plane.
- Albrecht, in Table 1, teaches small nitride semiconductors with FWHM's in the [0002] and [11-24] planes of 91 arc seconds and 110 arc seconds respectively.
- Melnik teaches large nitride semiconductor substrates with a FWHM in the [0002] plane of less than 90 arc seconds (col. 8, lines 10-16).
- It is the Examiners position that since Melnik and Albrecht teach similar materials and similar processes and similar FWHMS of the [0002] planes, that the FWHM of 110 seconds for the [11-24] plane as evidenced by Albrecht is present in Melnik.
- For nitride semiconductor substrates there is a direct correlation of FWHM's of the [11-24] and [20-24] planes as is evidenced by Table 2 of page 18 of

the instant specification. For all examples shown the FWHM's share a close relationship.

- Therefore in light of the breakdown presented above, a low FWHM (closely corresponding to 110-180) in the (20-24) plane is expected and inherently present in Melnik, which falls within the applicants instantly claimed range.

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The applicant's arguments otherwise are not persuasive. The burden is on the applicant to show that the instantly claimed FWHM for the {20-24} plane is not present in Melnik. **The applicant is invited to show evidence disproving the examiners position.**

The applicant's argue that Albrecht shows that FWHM for (0002) and (11-24) are pronouncedly different. The Examiner agrees. However, the Examiner is not arguing this position. The Examiner argues that the FWHM of 90 arc seconds for the (0002) plane is also taught by Melnik (col. 11), and thus Melnik would also inherently possess the FWHM of 110 in the (11-24) plane as taught by Albrecht. The [11-24] plane corresponds to FWHM's of the (20-24) plane, per the applicants instantly taught Table 2. Albrecht is not relied upon for its teaching of size and is solely relied upon for its teaching of FWHM's for diffraction planes of nitride semiconductor substrates.

The applicant merely agues Albrecht signally, by stating that Albrecht teaches a small size crystal this response is improper and in light of the applicants arguments presented above, the rejections are maintained.

Albrecht in view of Melnik

The applicants argue that Albrecht teaches a small size in order to achieve low FWHM's, and that a larger diameter results in a FWHM of 300 arc seconds as taught by Melnik would result in larger FWHM's, specifically out of the range instantly claimed. The Examiner disagrees, for reasons set forth below.

The applicant points to Melnik and states that support for their position is found in Melnik where Melnik teaches a FWHM of 300 in the (0002) plane. This may be the case in one specific example however as discussed above, the applicant must evaluate the entire disclosure of Melnik. The "applicant must look to the whole reference for what it teaches. Applicant cannot merely rely on the examples and argue that the reference did not teach others." In re Courtright, 377 F.2d 647, 153 USPQ 735,739 (CCPA 1967). The applicant again fails to realize the entire specification and scope of Melnik which teaches that the FWHM in the (0002) plane may be in the range of 60-360 arc seconds. A FWHM of 90, as taught by Albrecht, which falls within Melnik's taught range, is the position that the Examiner has taken in response to the applicants arguments.

Therefore Melnik teaches a FWHM of 90 arc seconds in the (0002) plane, which closely corresponds to the 91 arc second (0002) FWHM of Albrecht. Therefore the

applicants position that as the diameter of a substrate increases the quality of the GaN crystals decreases is not commensurate with the scope of the prior art.

It is noted that "the arguments of counsel cannot take the place of evidence in the record", *In re Schulze*, 346 F.2d 600, 602, 145 USPQ 716, 718 (CCPA 1965). It is the examiner's position that the arguments provided by the applicant regarding the prior art must be supported by a declaration or affidavit. As set forth in MPEP 716.02(g), "the reason for requiring evidence in a declaration or affidavit form is to obtain the assurances that any statements or representations made are correct, as provided by 35 U.S.C. 24 and 18 U.S.C. 1001".

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JONATHAN C. LANGMAN whose telephone number is (571)272-4811. The examiner can normally be reached on Mon-Thurs 8:00 am - 6:30 pm EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Callie Shosho can be reached on 571-272-1123. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

JCL

/Callie E. Shosho/
Supervisory Patent Examiner, Art Unit 1794